



Case Report

Bedside physician led US-guided supra-clavicular lymph node biopsy and ROSE (rapid on-site evaluation): SVC obstruction swift management in lung cancer

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A B S T R A C T

Superior vena cava obstruction (SVCO) is an oncological emergency and can often be linked to an underlying lung malignancy. Due to the potential life-threatening risks associated with SVCO, it necessitates urgent diagnosis and management. In this report, we discuss 3 case studies where the use of ultrasound-guided supraclavicular lymph node biopsy was used to obtain a biopsy from patients with SVCO, followed by rapid on-site evaluation (ROSE). The benefits of this technique ensure a more rapid histological diagnosis, while also involving a less invasive procedure for the patient. The histological diagnosis is essential in improving patient outcomes when treating those with SVCO as the recommended treatments vary depending on the underlying type of lung malignancy. Having this information can help the clinician swiftly employ the optimal treatment pathway for the patient.

1. Background

The incidence of lung cancer continues to increase and lung cancer is associated with high mortality rates, often due to detection at a late stage. Patients commonly have multiple co-morbidities and are not fit for invasive management. Furthermore, long-term survival rates have not been extensively studied due to the often advanced initial prognosis of the disease for many patients [1,2].

Malignant SVCO is an oncological emergency and is most commonly caused by lung cancers or non-Hodgkin lymphoma. It may also be the initial presentation of a new diagnosis of lung cancer. It is defined as a partial or complete reduction in blood flow through the SVC. Causes include extrinsic compression of the SVC or invasion of the tumour through the vessel wall. The signs and symptoms are often an indicator of increased venous pressure in the upper body, and may develop gradually or acutely [3].

Timely intervention of SVCO is essential. Investigations include a CXR, CT chest and biopsies. Radiotherapy and steroids, endovascular stenting, and chemotherapy are all treatment options and the choice of these should be tailored based on histological diagnosis of the aetiological malignancy, to ensure optimal patient outcomes [4].

US-guided FNA and ROSE is of diagnostic benefit in these patients, with favourable outcomes including a less invasive procedure needed to obtain the biopsy. This carries less risks to the patient and may be more suitable for patients with multiple co-morbidities, as well as being more patient preferable due to the reduced recovery time needed. It allows the use of less resources and has the potential of being a more cost-effective approach to obtaining biopsies. Furthermore, this approach may allow more rapid diagnostics of the biopsy which is especially important in this particular time-sensitive condition of SVCO that we are considering in this case report [5,6].

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2. Case report

2.1. Case 1

A 69 year-old gentleman presented with a history of worsening dyspnoea, hoarseness and increasing frequency of headaches. He was an ex-smoker with a total history of 40 pack years, and was employed in the building industry. He was independent and had an ECOG (WHO performance status) [7] of 1. His chest X-ray showed widened mediastinum with non-specific parenchymal changes (Image 1). A CT chest (Image 2) showed extensive central areas of tissue suspicious for malignancy and SVCO. Reconstruction of images showed the heavy burden of SVCO with severe congestion and dilatation of collateral veins (Image-2a), to the extent that they were visible on the skin surface (Image-2b). Bed-side ultrasound showed supra-clavicular lymph nodes and hyper-dynamic movements (Twirls) of SVC blood (Image 3). Lymph node FNA (fine needle aspiration) biopsy was carried out and the ROSE (rapid on-site evaluation) revealed small cell lung cancer. The patient received chemotherapy and their symptoms improved. A 3 month follow-up CT scan showed significant radiological resolution of the SVCO (Image 4). Unfortunately, he passed away 18 months after his initial diagnosis with further spread of the disease.

2.2. Case 2

A 56 year-old gentleman presented with a history of hoarseness, recurrent headaches, worsening dyspnoea, several episodes of haemoptysis and a significant amount of weight loss over a short period of time. He was unable to lie flat. He was a current smoker with a total history of 30 pack years. His chest X-ray showed a large mediastinal abnormal growth (Image 1). A CT chest showed right hilar and mediastinal masses, pleural effusion and SVCO (Image 2). Reconstruction of images showed significant dilatation of vessels due to SVCO (Image 3). Bed-side ultrasound showed supra-clavicular lymph nodes viable for biopsy (Image 4). Lymph node FNA and ROSE confirmed a non-small cell lung cancer. The patient had an SVC stent inserted by interventional radiology which provided rapid symptomatic relief (Image 5). Immunohistology confirmed a primary adenocarcinoma of the lung.



Image 1.



Image 2.



Image 3.

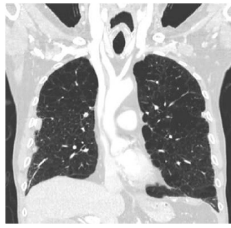


Image 4.

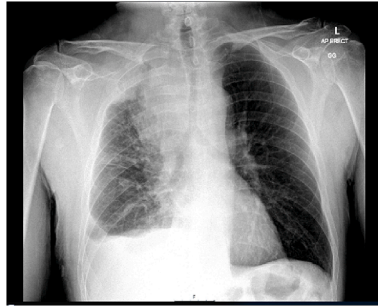


Image 1.



Image 2 + Image 3.

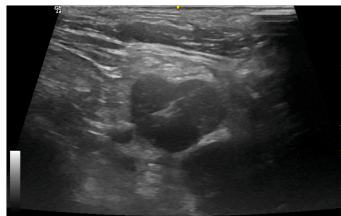


Image 4.

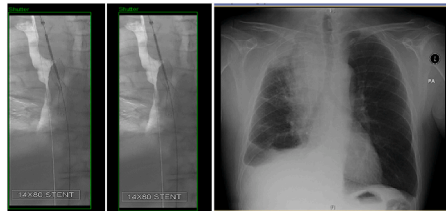


Image 5.

2.3. Case 3

A 71 year-old lady presented with a 10-week history of unsteadiness, reduced exercise tolerance, dysphagia, weight loss, increased dyspnoea and general deterioration. She had a past medical history of COPD. She had a total history of 30 pack years but had not smoked for 6 weeks pre-admission. She had an ECOG of 3. On general examination, she was frail with a visible swelling over her right

clavicle. Her chest X-ray showed a significant right upper and mid-zone abnormality (Image 1). A CT chest and reconstruction of images showed right upper lobe collapse, right hilar extension and supraclavicular lymph nodes, multiple bone metastases in the spine, fracture of the right clavicle and the femur, and an incomplete SVCO (Image 2 + Image 3). The clavicular and femoral fractures were found to be pathological. Orthopaedic input was obtained for the fractures with a femoral nail inserted, and conservative management for the clavicular fracture. A bone scan showed multi-focal extensive bone metastases (Image 4). Lymph node FNA biopsy was performed which revealed non-small cells. The case was discussed at the lung cancer multi-disciplinary meeting, and a decision for best supportive palliative care was agreed upon. Immunohistology confirmed a primary adenocarcinoma of the lung.

3. Discussion

The majority of SVCO are caused by a malignancy, and a large proportion of these are due to a lung malignancy. It has the potential to cause life-threatening risks to the patient and must be dealt with swiftly.

Signs and symptoms depend upon the extent of SVCO and the radiological burden of the tumour, and thorough and rapid diagnosis of the patient is crucial. Symptoms can include dyspnoea, headaches, dizziness, visual changes and swelling of face, neck and arms. Clinical examination may show altered voice, hoarseness, tachypnoea, change in skin colour and enlargement of the superficial vessels of the neck, upper limbs and trunk. Signs and symptoms can be exacerbated on bending forwards or lying down due to increase in venous pressure. Patients can present as critically unwell due to compression of the main thorax and neck vessels alongside, leading to

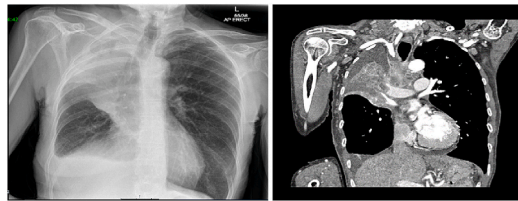


Image 1 + Image 2.

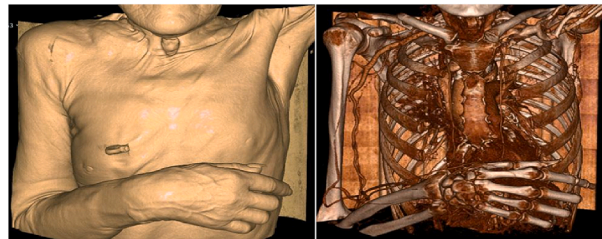


Image 3.



Image 4.

risk of airway collapse, causing respiratory distress and respiratory failure. There can be fatal deterioration in the condition and as such, the immediate restoration of the patency of the SVC is warranted [8,9].

Diagnosis can be made clinically but chest X-rays and CT scans are often used to confirm the exact diagnosis [10].

Ultrasound guided biopsy is known to be an advantageous technique to obtain samples as it is effective while being minimally invasive to the patient, and typically US guided biopsies have a high diagnostic yield of obtaining the sample material [11]. The benefits of this include reduction in risk of further compression of the SVC, less pain and recovery time for the patient and reduced bleeding risk as well as reducing anaesthetic-associated risks [12]. The number of in-patient stays and complications post-procedure are reduced compared to more invasive biopsy techniques.

The use of US-guided biopsy and ROSE can allow a more rapid histological diagnosis and therefore, allow clinicians to choose a more tailored treatment for the patient. The use of the ROSE services for interpreting biopsies can be useful to more quickly establish if there have been sufficient tissue samples received for diagnosis [13]. With the high mortality rate associated with lung cancer and the high risk of metastases, knowing the histology of the tumour causing SVCO can have long-term benefits to the patient by using this patient-specific knowledge to implement the most appropriate targeted treatment [14].

The conventional methods of tissue diagnosis techniques such as CT guided biopsies, endobronchial procedures, and departmental ultrasound-guided procedures are time-consuming, labour intensive and costly. Our case series demonstrates that the practice of a physician bedside-led biopsy alongside ROSE ensures reduced procedural and theatre costs. This case series highlights the versatility of our biopsy practice and hints to explore the possibility of organising dedicated randomised studies to explore areas of interest such as cost analysis further and effectively.

The evidence demonstrated in our case series is further reinforced by similar findings in other case studies carried out [15,16].

Furthermore, carrying out an US-guided biopsy before giving systemic treatments can improve the quality of the biopsy specimen as high-dose steroids and radiotherapy can degrade the specimen [17,18].

With the life-threatening risks of SVCO, it is imperative to initiate treatment as soon as possible. Management of SVCO is initially supportive including oxygen and airway support. Dexamethasone is often used for symptomatic relief and is classically given immediately when SVCO is diagnosed, to relieve pressure symptoms. However, steroids are at increased risk of affecting the quality of biopsy samples. This is another reason for implementing rapid diagnostic biopsies at the bedside, as the immediate risk of SVCO must be dealt with but histology may be more valuable to choose the appropriate definitive management, particularly if this is the first presentation of a new lung malignancy [19].

With regard to definitive treatment of the underlying SVCO, stenting of the SVCO is an option employed for all types of lung cancer and can be used as a stand-alone treatment or in combination with systemic therapies. It is recommended in the NICE guidelines as an effective measure to rapidly improve symptoms, as the effects of chemotherapy or radiotherapy may take some time to show effects, as well as an adjunct if other options have failed. It also causes no damage to tissues, further facilitating the option of obtaining biopsies before starting any systemic treatments. Anti-coagulation may be used in patients with a thrombus causing the SVCO. Typically chemotherapy or chemo-radiotherapy is recommended as initial treatment for patients with small cell lung cancer. Radiotherapy is the management choice for patients with less chemo-receptive tumours such as non-small cell lung cancer. Both options depend on staging and histology of the tumour, alongside vital factors such as patient's performance status and co-morbidities [20–22].

4. Conclusion

US-guided supraclavicular lymph node biopsy and ROSE is a technique with many benefits and may be used in patients with SVCO to dictate patient-focused treatment plans. It has less patient risks and may improve diagnosis, therefore improving clinical decisions and improving patient safety outcomes.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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